

# UK Patent Application GB 2 370 979 A

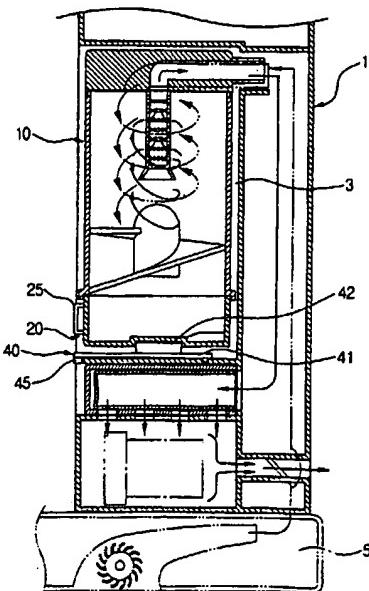
(43) Date of A Publication 17.07.2002

(21) Application No 0118384.7	(51) INT CL <sup>7</sup> A47L 9/16
(22) Date of Filing 27.07.2001	(52) UK CL (Edition T ) A4F FFD FSCA
(30) Priority Data (31) 01001609      (32) 11.01.2001      (33) KR	(56) Documents Cited EP 0928594 A1      WO 98/35602 A1
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(54) Abstract Title  
**Dust collecting assembly for a vacuum cleaner**

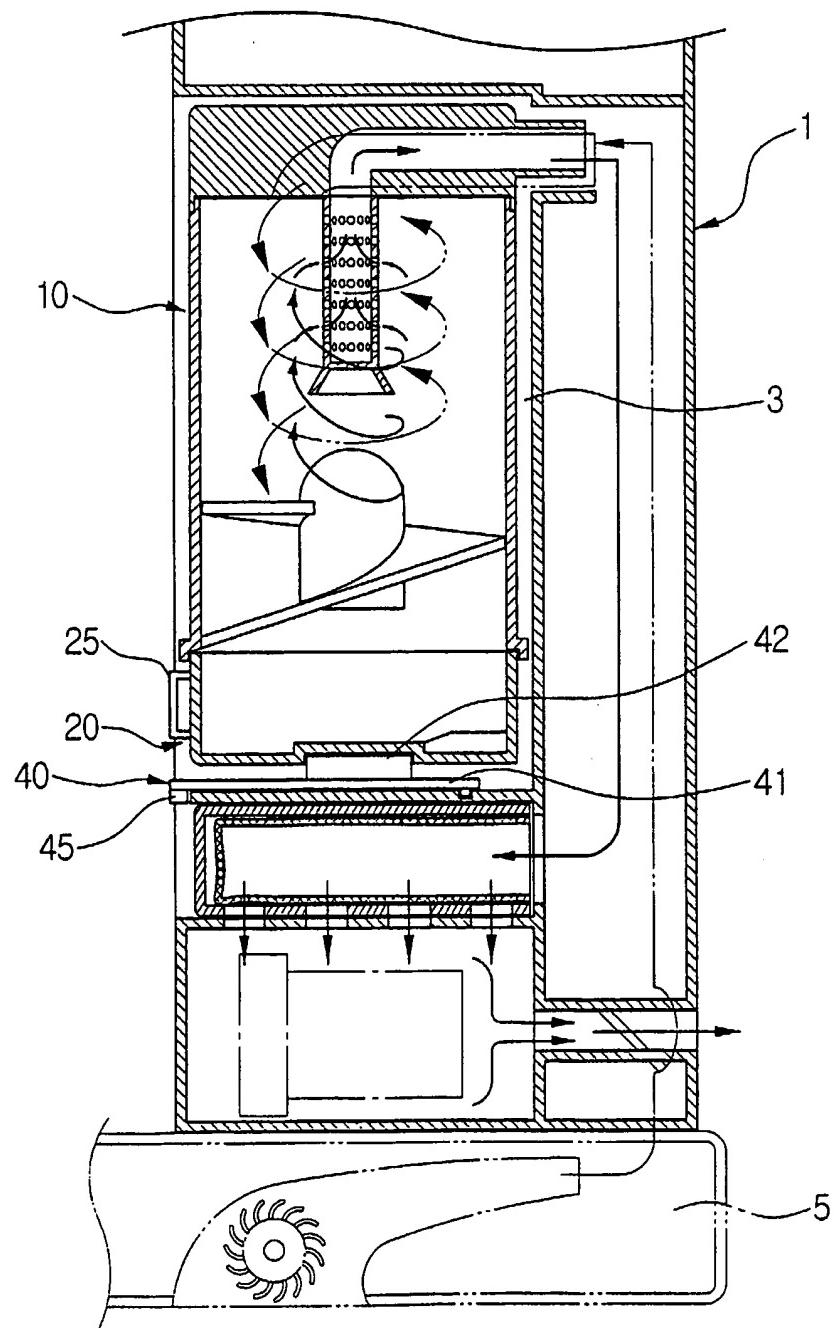
(57) A cyclone dust collecting assembly for a vacuum cleaner includes a dust barrel (20) which is detachable from a cyclone body (10). The cyclone dust collecting assembly includes the cyclone body (10) which is disposed in a dust chamber (3) of a cleaner body of the vacuum cleaner, the cyclone body separating, by centrifugal force, contaminants from air that is drawn through a suction brush (5) of the vacuum cleaner. The dust barrel (20) is removably connected to a lower end of the cyclone body (10). The dust barrel (20) communicates with the cyclone body (10) and collects the contaminants. The assembly further includes a lever mechanism (40) for removably connecting the dust barrel (20), in the dust chamber (3), to the lower end of the cyclone body (10).

FIG.1



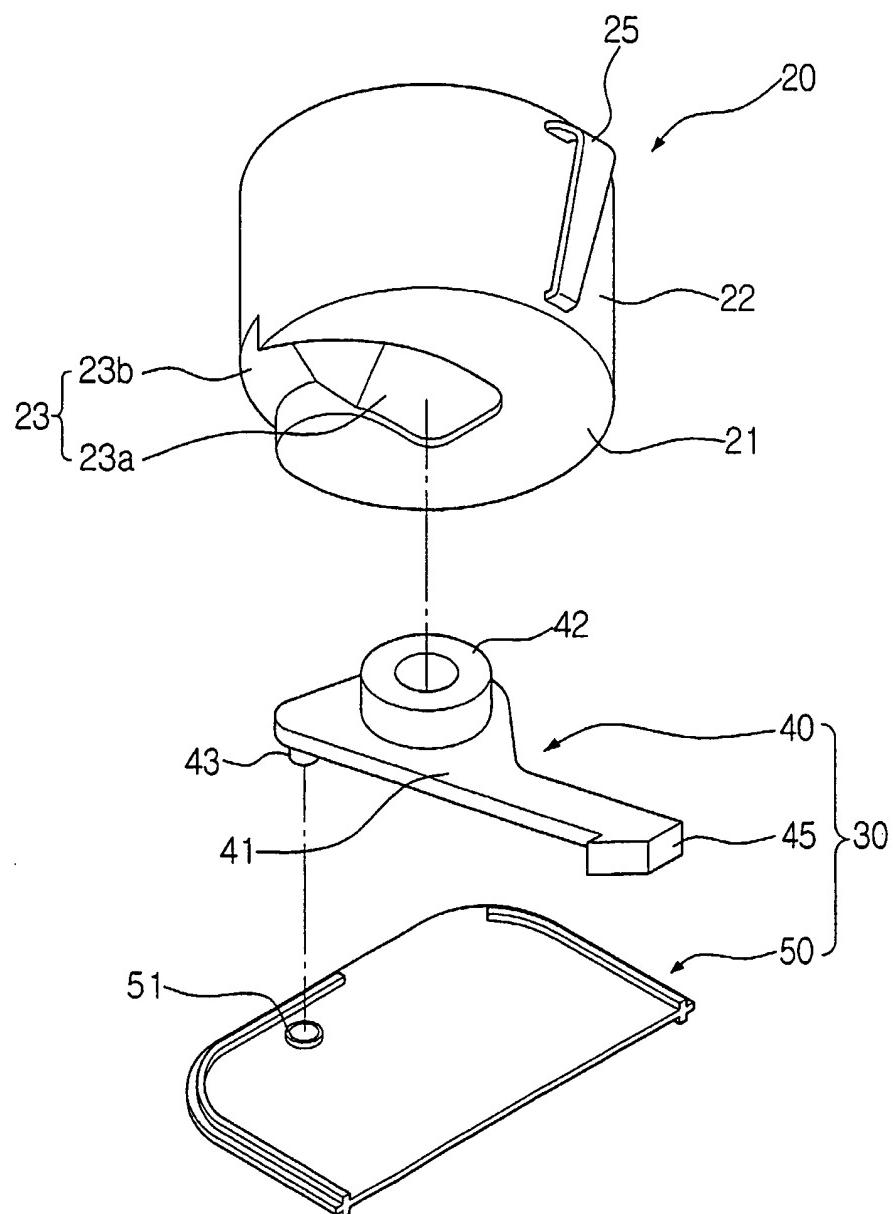
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FIG.1



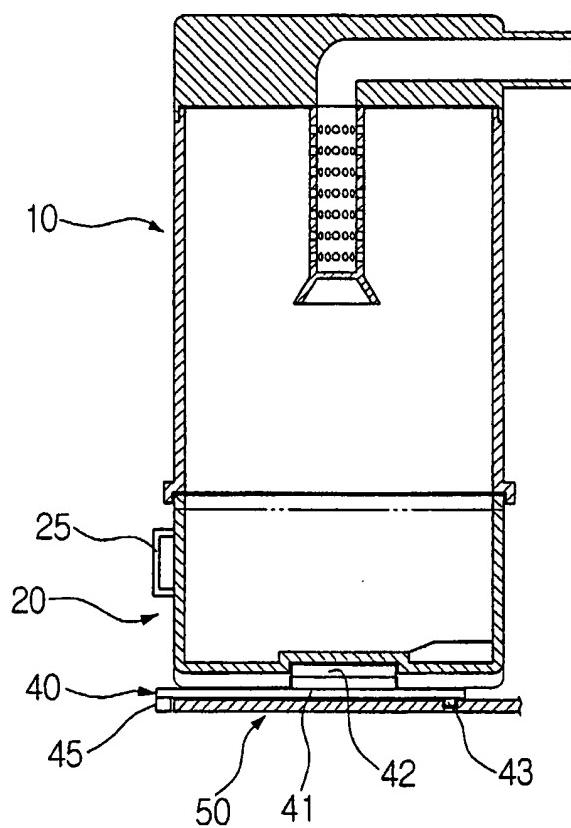
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FIG.2



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FIG.3



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FIG.4A

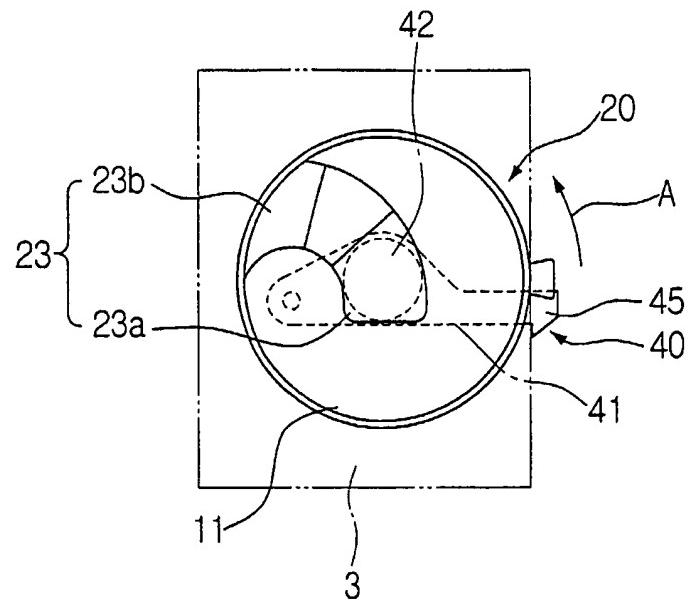
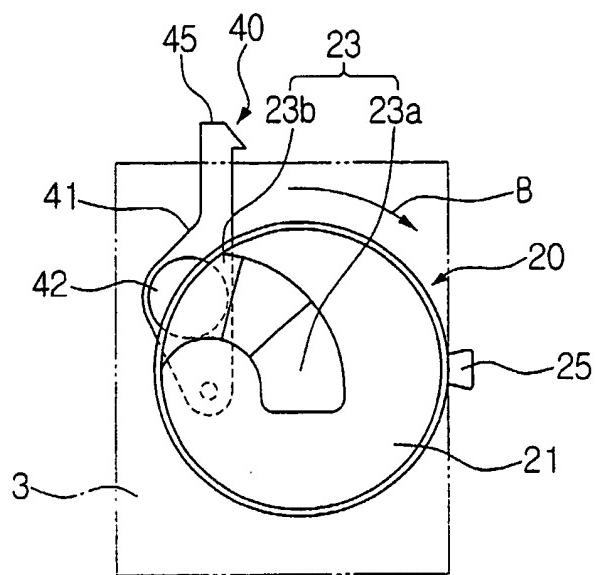


FIG.4B



**DUST COLLECTING ASSEMBLY FOR A VACUUM CLEANER**

The present invention relates to a dust collecting assembly for a vacuum cleaner, and more particularly to a cyclone dust collecting assembly having a dust receptacle.

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Generally, cyclone dust collecting apparatus for a vacuum cleaner operates by directing air into a vortex. The cyclone dust collecting apparatus uses the centrifugal force of the vortex to separate contaminants from the air, and to collect the separated contaminants.

- 10 The cyclone dust collecting apparatus includes a cyclone body for directing the air, drawn into the vacuum cleaner, into a vortex, and for separating the contaminants from the air by centrifugal force. The cyclone dust collecting apparatus further includes a dust barrel for collecting the separated contaminants. The cyclone body and the dust barrel are integrally formed with each other. The cyclone dust collecting apparatus is received in a dust chamber of the vacuum cleaner. The dust barrel has a bottom plate formed on a lower end, which is arranged to be opened and closed. Accordingly, when the dust barrel becomes full of contaminants, the cyclone dust collecting apparatus is removed from a cleaner body in the vacuum cleaner. Then, the bottom plate is opened in order to dispose of the contaminants which have collected in the dust barrel.
- 15

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It is an object to provide an improved cyclone dust collecting apparatus.

- According to a first aspect of the present invention, there is provided a cyclone dust collecting assembly for a vacuum cleaner, the assembly comprising: a cyclone body for location in a dust chamber of a vacuum cleaner body, the cyclone body being arranged to separate, by centrifugal force, contaminants from air that is drawn through a suction brush of the cleaner; a dust receptacle removably connectable to a lower end of the cyclone body and being arranged to collect the contaminants separated by centrifugal force; and means for removably connecting the dust receptacle in the dust chamber, to the lower end of the cyclone body.
- 25
- 30

According to a second aspect of the present invention there is provided a cyclone dust collecting assembly for a vacuum cleaner which has a suction brush and a dust chamber, the cyclone dust collecting assembly comprising: a cyclone body for location in the dust chamber and arranged to separate contaminants from air drawn in through the suction brush; a dust receptacle removably connectable to a lower end of the cyclone body and arranged to collect the contaminants, the dust receptacle including a bottom plate having a recess formed therein; and a movable element for raising and lowering the dust barrel into and out of engagement with the cyclone body, the movable unit including a protrusion, the protrusion being received in the recess of the bottom plate.

According to a third aspect of the present invention, particle collecting apparatus for a vacuum cleaner comprises: a cyclone body for mounting to the cleaner, the cyclone body being arranged to receive a mixture of air and particles and to induce a vortex such that the particles are displaced to an outer region of an interior space of the cyclone body due to centrifugal force; a particle collecting receptacle for detachable connection to the cyclone body and arranged to receive the particles displaced to the outer region of the cyclone body; and means arranged to displace the particle collecting receptacle between a first position in which the particle collecting receptacle can be removed from the cyclone body, and an operative second position in which the particle collecting receptacle is connected to the cyclone body.

The connecting means may comprise a movable unit movably disposed on a lower side of the dust receptacle for reciprocal movement raising and lowering the dust receptacle. The movable unit can be received in and move along a slanted recess formed in a lower end of the dust receptacle. The connecting means may further include a base for movably supporting the movable unit from a lower portion of the dust chamber. The dust receptacle typically takes the form of a dust barrel having, for instance, a generally circular cross-section.

Further, it is preferable that the slanted recess spirals outwards from a centre region to an outer edge of the dust receptacle, gradually increasing in depth as it extends toward the outer edge.

- 5      The movable unit can include a movable lever disposed between the base of the connecting means and the dust barrel. The movable lever may have a protrusion that is inserted into and guided along the slanted recess, a rotary pin formed on one end of the movable lever for rotatably supporting the movable lever to the base, and a handle formed on the other end of the movable lever and arranged to be exposed to the outside
- 10     of the dust chamber.

It is preferable that the movable lever, the rotary pin, and the handle are integrally formed with each other.

- 15     It is also preferable that the protrusion, which is formed on the movable lever, is offset from a middle line or main axis of the movable lever.

It is also preferable that the base is integrally formed in the cleaner body.

- 20     The dust barrel may have a handle formed on an outer surface thereof.

The invention also includes an upright-type vacuum cleaner having a cyclone dust collecting assembly or particle collecting apparatus as described above.

- 25     The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a cross-sectional view of part of an upright-type vacuum cleaner having a cyclone dust collecting assembly in accordance with the present invention;

- 30     Figure 2 is an exploded perspective view of part of the cyclone dust collecting assembly of Figure 1;

Figure 3 is a cross-sectional view of the cyclone dust collecting assembly shown in Figure 1, in an assembled state; and

- 5 Figures 4A and 4B are, respectively, plan views showing the operation of a locking/unlocking means appearing in Figures 1 to 3.

Referring to Figure 1, a vacuum cleaner includes a cleaner body 1 and a suction brush 5 coupled to the cleaner body 1. Within the cleaner body 1 the vacuum cleaner has a dust 10 chamber 3. The vacuum cleaner further includes a cyclone dust collecting assembly disposed in the dust chamber 3. The cyclone dust collecting assembly includes a cyclone body 10 mounted in the dust chamber 3, a dust barrel 20 removably mounted to a lower end of the cyclone body 10, and connecting/separating means 30.

15 The cyclone body 10 guides the air drawn through the suction brush 5 of the vacuum cleaner into a vortex of air and uses the centrifugal force of the vortex to separate contaminants from the air. The cyclone body 10 is disposed in an upper portion of the dust chamber 3.

20 The dust barrel 20, which is also mounted in the dust chamber 3, is detachable from the cyclone body 10. The dust barrel 20 has an open upper end. Accordingly, when the dust barrel 20 is connected to the cyclone body 10, the open upper end of the dust barrel 20 communicates with the cyclone body 10. Contaminants that have been separated from the air by centrifugal force, pass through the open upper end of the dust barrel 20, 25 and are collected in the dust barrel 20.

As shown in Figure 2, the dust barrel 20 has a closed end (formed by a bottom plate 21 and a cylindrical sidewall 22. The bottom plate 21 has a slanted recess 23 which is inclined to a predetermined depth. More specifically, the slanted recess 23 spirals 30 outward, gradually increasing in depth, from a centre region of the bottom plate 21 to an outer edge region of the bottom plate 21. Further, the slanted recess 23 has a centre portion 23a which is recessed by a predetermined depth, and an outer edge portion 23b

which is recessed by a greater depth than the centre portion 23a. It is preferable that the dust barrel 20 also includes a handle 25 formed on the sidewall 22.

- The connecting/separating means 30 removably connect the dust barrel 20, which is
- 5 mounted in the dust chamber 3, to the lower end of the cyclone body 10. The connecting/separating means 30 includes a movable 40 movably disposed on a lower side of the dust barrel 20 so as to be pivotable in a reciprocal manner, and a base 50 for supporting the lever 40 on a lower wall of the dust chamber 3.
- 10 The lever 40 comprises a lever arm 41, a rotary pin 43 and a handle 45. The lever 41 is disposed between the base 50 and the dust barrel 20. The rotary pin 43 is disposed on one end of the arm 41, while the handle 45 is disposed on the other end. The arm 41 has a protrusion 42 which extends upwards from one side of the arm 41 by a predetermined height and which is inserted into and guided along the slanted recess 23.
- 15 The rotary pin 43, which is integrally formed with the arm 41, is inserted in a supporting hole 51 formed in the base 50. Accordingly, the rotary pin 43 pivotally supports the movable lever 40 on the base 50. That is, the lever 40 is reciprocally pivotable about the rotary pin 43. When the lever 40 is pivoted, the protrusion 42 moves along the slanted recess 23 to raise or lower the dust barrel 20.
- 20 The handle 45 is located along the front of the dust chamber 3 to facilitate a user's handling of the lever 40. The handle 45 is integrally formed with the lever arm 41. Further, the protrusion 42, which is formed on the lever arm 41, is offset from the middle line or main axis of the arm 41 and located closer to the rotary pin 43. By
- 25 forming the protrusion 42 closer to the rotary pin 43, more moment is exerted by the handle 45. Accordingly, less force is required to pivot the lever arm 41. It is preferable that the protrusion 42 is formed in the shape of a cylinder so as to reduce any frictional force with the slant recess 23.
- 30 The base 50 is mounted on the lower side of the movable lever 40 and formed in the shape of a plate. Accordingly, the movable lever 40 pivots horizontally along an upper

surface of the base 50. The base 50 may be integrally formed with the cleaner body 1. Also, the base 50 may be slidably disposed at the lower portion of the dust chamber 3.

The operation of the cyclone dust collecting assembly, constructed as above, will be  
5 described below.

Figure 3 is a cross-sectional view showing the cyclone body 10 and the dust barrel 20 of  
the cyclone dust collecting assembly in an assembled state. A dashed line indicates the  
state of the cyclone dust collecting assembly when the dust barrel 20 is separated from  
10 the cyclone body 10.

Referring to Figure 3, in the assembled state, the protrusion 42 of the lever 40 is  
positioned at the centre portion 23a of the slanted recess 23, raising the dust barrel 20  
into contact with the cyclone body 10. In this state, the handle 45 is at the front of the  
15 dust chamber 3 (see Figure 4A).

When the user holds the handle 45 and pivots the movable lever 40 in a direction  
indicated by the arrow A, as shown in Figure 4A, the protrusion 42 is moved along the  
slanted recess 23 to the outer edge portion 23b (see Figure 4B) of the dust barrel 20.  
20 Accordingly, the dust barrel 20 is lowered to the position indicated by the dashed line in  
Figure 3 and separated from the cyclone body 10. The user can then hold the handle 25,  
and pull the dust barrel 20 forward, removing the dust barrel 20 from the dust chamber  
3. The user can then carry the dust barrel 20 over to a dustbin and empty the contents  
of the dust barrel 20 into the dustbin. As described above, in order to empty the dust  
25 barrel 20, the user detaches the dust barrel 20 from the cyclone body 10 and removes  
only the dust barrel 20 from the dust chamber 3. Accordingly, unlike conventional dust  
collecting apparatus, in which the user must remove the entire apparatus, here, the  
detachable dust barrel 20 is easier to handle since the user does not have to remove the  
entire cyclone dust collecting apparatus in order to empty the dust barrel 20.

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Further, in order to re-insert the dust barrel 20 in the dust chamber 3, the user places the  
dust barrel 20 into the dust chamber 3 with the movable lever 40 positioned as shown in

Figure 4B. The protrusion 42 is positioned at the outer edge portion 23b of the slanted recess 23. As the user pivots the handle 45 in the direction indicated by the arrow B, the handle 45 returns to the state shown in Figure 4A, and the protrusion 42 moves along the slanted recess 23 of the dust barrel 20 to the centre portion 23a. Since the 5 centre portion 23a is recessed to a lesser depth than the outer circumference portion 23b, the dust barrel 20 is raised by the protrusion 42. Accordingly, the dust barrel 20 is pushed upwards and connected to the lower end of the cyclone body 10 (see Figure 1).

Once the dust barrel 20 is connected to the cyclone body 10 in the dust chamber 3, any 10 separation of the dust barrel 20, from the cyclone body 10, is prevented, even when the user moves the vacuum cleaner during cleaning.

In this embodiment, although the cyclone dust collecting assembly is employed in an upright-type vacuum cleaner, the cyclone dust collecting assembly may also be 15 employed in a canister-type vacuum cleaner.

## CLAIMS

1. A cyclone dust collecting assembly for a vacuum cleaner, the assembly comprising:
  - 5 a cyclone body for location in a dust chamber of a vacuum cleaner body, the cyclone body being arranged to separate, by centrifugal force, contaminants from air that is drawn through a suction brush of the cleaner;
  - a dust receptacle removably connectable to a lower end of the cyclone body and being arranged to collect the contaminants separated by centrifugal force; and
- 10 means for removably connecting the dust receptacle in the dust chamber, to the lower end of the cyclone body.
2. An assembly according to claim 1, wherein the connecting means comprises:
  - 15 a movable unit for location at a lower side of the dust receptacle and arranged to raise and lower the dust receptacle in a reciprocal manner by moving along a slanted recess formed in a lower end of the dust receptacle; and
  - a base for movably supporting the movable unit in a lower portion of the dust chamber.
- 20 3. An assembly according to claim 2, wherein the slanted recess of the dust receptacle spirals outwards from a centre region to an outer edge of the dust receptacle, the slanted recess gradually increasing in depth as it extends towards the outer edge.
4. An assembly according to claim 2 or claim 3, wherein the movable unit comprises:
  - 25 a movable lever disposed between the base and the dust barrel, the movable lever having a protrusion, the protrusion being received in and guided along the slanted recess of the dust barrel;
  - a pin formed on one end of the lever, for rotatably supporting the lever on the base; and
  - 30 a handle formed on another end of the lever and arranged to extend generally outside the dust chamber.

5. An assembly according to claim 4, wherein the lever, the pin, and the handle are integrally formed with each other.
6. An assembly according to claim 4 or claim 5, wherein the protrusion is formed  
5 on the lever and is offset from a middle line of the lever.
7. An assembly according to any preceding claim, wherein the base is integrally formed in the cleaner body.  
  
10 8. An assembly according to any preceding claim, wherein the dust receptacle has a handle formed on an outer wall thereof.
9. A cyclone dust collecting assembly for a vacuum cleaner which has a suction brush and a dust chamber, the cyclone dust collecting assembly comprising:  
15       a cyclone body for location in the dust chamber and arranged to separate contaminants from air drawn in through the suction brush;  
       a dust receptacle removably connectable to a lower end of the cyclone body and arranged to collect the contaminants, the dust receptacle including a bottom plate having a recess formed therein; and  
20       a movable element for raising and lowering the dust barrel into and out of engagement with the cyclone body, the movable unit including a protrusion, the protrusion being received in the recess of the bottom plate.
10. An assembly according to claim 9, wherein the recess spirals outwards and  
25 gradually increases in depth from a centre region of the bottom plate, to an outer circumference of the dust receptacle.
11. An assembly according to claim 9 or claim 10, wherein the movable unit includes a lever having a first and a second end, a pin located proximate the first end,  
30 and a handle located at the second end, and further comprising a base pivotally supporting the movable unit, the base having a supporting hole for receiving the pin.

12. An assembly according to claim 11, wherein the lever, the pin and the handle of the movable unit are integrally formed.
13. An assembly according to claim 11 or claim 12, wherein a centre of the protrusion is offset from a main axis of the movable unit.
14. An assembly according to any of claims 9 to 13, wherein the dust barrel has a handle formed on an outer wall thereof.
- 10 15. Particle collecting apparatus for a vacuum cleaner, the particle collecting apparatus comprising:
- a cyclone body for mounting to the cleaner, the cyclone body being arranged to receive a mixture of air and particles and to induce a vortex such that the particles are displaced to an outer region of an interior space of the cyclone body due to centrifugal force;
- a particle collecting receptacle for detachable connection to the cyclone body and arranged to receive the particles displaced to the outer region of the cyclone body; and
- means arranged to displace the particle collecting receptacle between a first position in which the particle collecting receptacle can be removed from the cyclone body, and an operative second position in which the particle collecting receptacle is connected to the cyclone body.
- 20 16. Apparatus according to claim 15, wherein the particle collecting receptacle has a longitudinal axis and wherein the displacement means is situated below the particle collecting receptacle, and comprises a lever, movement of the lever causing the particle collecting receptacle to move along the longitudinal axis of the particle collecting receptacle.
- 30 17. Apparatus according to claim 16, wherein the lever is moveable about a first axis which is different from the major axis of the particle collecting apparatus.

18. A particle collecting apparatus according to claim 16 or claim 17, wherein the particle collecting receptacle includes a sloping recess formed in a lower surface thereof, the lever comprising a protrusion for being inserted within the sloping recess.
- 5     19. A vacuum cleaner comprising:  
          a dust chamber; and  
          a particle collecting apparatus according to any of claims 15 to 18, the cyclone body of the particle collecting apparatus being disposed within the dust chamber, and the particle collecting receptacle of the particle collecting apparatus being removable  
10    from the dust chamber.
20. A vacuum cleaner according to claim 19, wherein the vacuum cleaner is an upright vacuum cleaner or a canister vacuum cleaner.
- 15    21. A cyclone dust collecting assembly for a vacuum cleaner, constructed and arranged substantially as hereinbefore described and shown in the accompanying drawings.
22. A particle collecting apparatus for a vacuum cleaner, constructed and arranged  
20    substantially as hereinbefore describe and shown in the accompanying drawings.



Application No: GB 0118384.7  
Claims searched: 1-14

12. Examiner: John Wilson  
Date of search: 5 October 2001

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): A4F[FFD FSCA FSCW]

Int Cl (Ed.7): A47L 9/16

Other: Online:- WPI, EPODOC, PAJ

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0928594 A1      Royal Appliance - whole document - note fig. 14 and see col.7 l.12 et seq	1 at least
X	WO 98/35602 A1      AB Electrolux - whole document - note fig.2	1 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.